



Chunghwa Picture Tubes, Ltd.

Technology Specification

TFT LCD

CLAA121UA01CW

APPROVED BY	CHECKED BY	PREPARED BY

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CONTENTS

1. OVERVIEW	4
2. ABSOLUTE MAXIMUM RATINGS	5
3. ELECTRICAL CHARACTERISTICS.....	7
3.1 TFT LCD	7
3.2 TFT-LCD Current Consumption	8
3.3 Power、Signal sequence	8
3.4 Backlight.....	9
4. INTERFACE CONNECTION.....	10
4.1 CN1 (Input Signal).....	10
5. INPUT SIGNAL(DE ONLY MODE)	12
5.1 Timing Specification	12
5.2 Timing sequence(Timing chart).....	12
6. MECHANICAL DIMENSION	14
6.1 Front Side	14
6.2 Rear Side	15
7. OPTICAL CHARACTERISTICS	16
8. RELIABILITY TEST	19
8.1. Temperature and humidity	19
8.2. Shock and Vibration	19
8.3. Electrostatic Discharge	19
8.4. Judgment standard	19



1. OVERVIEW

CLAA121UA01CW is 12.1" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs ,control circuit and LED backlight. By applying 1600RGBx900 images are displayed on the 12.1" diagonal screen. Display 16.2M colors by R.G.B signal input.

General specification are summarized in the following table:

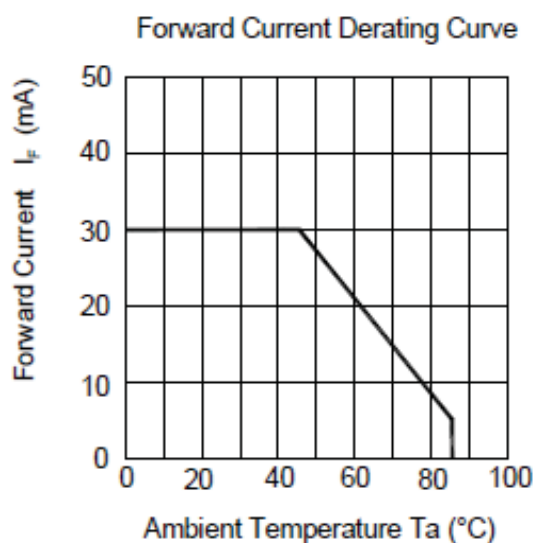
ITEM	SPECIFICATION
Display Area (mm)	267.6 (H) x 150.525(V)
Number of Pixels	1600RGBx900
Pixel Pitch (mm)	0.16725 (H) ×0.16725 (V)
Color Pixel Arrangement	Strip RGB
Display Mode	Normally white
Number of Colors	26.2K
Optimum Viewing Direction	6 O'clock
Brightness (cd/m ²)	250 (typ)
Response Time (ms)	20 (typ.)
NTSC	45%
Contrast Ratio	min. 300 typ. 500
Viewing Angle(H/V)--CR>10	R:45 / L:45 / U:15 / D:35
Power Consumption (W)	4.32W(Typ)
Interface connection	LVDS
Module Size (mm)	280.7 x 165.75 x 2.85 (w/oPWB) 280.7 x 165.75 x 4.45 (w/PWB)
Module Weight (g)	189.51g
Backlight Unit	LED
Surface Treatment	Anti-Glare

2. ABSOLUTE MAXIMUM RATINGS

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

ITEM	SYMBOL	CONDITIONS	MIN	MAX	UNIT	NOTE
Digital Power Supply Voltage	DVDD VDD_LVDS		-0.3	4	V	
Singnal Input Voltage	NIN0 ~ NIN2 PIN0 ~ PIN2 NINC,PINC		-0.3	DVDD	V	
ICC Rush current	I _{CC} RUSH	-		1	A	Note 4
ILED Rush current	I _{LED} RUSH			1	A	Note 4
Forward Current (per LED)	If			30	mA	Note1
Reverse Voltage (per LED)	VR			5	V	
Pulse forward current (per LED)	I _{fp}			100	mA	Note2
Operating temperature	Topa		0	50	°C	Note3
Storage temperature	Tstg		-20	50	°C	

Note1: Each LED operating must under the condition as below drawing.
(Ambient Temperature /Allowable Forward Current)



Note2: I_{fp} Conditions : Pulse Width ≤ 10msec · Duty ≤ 1/10 .

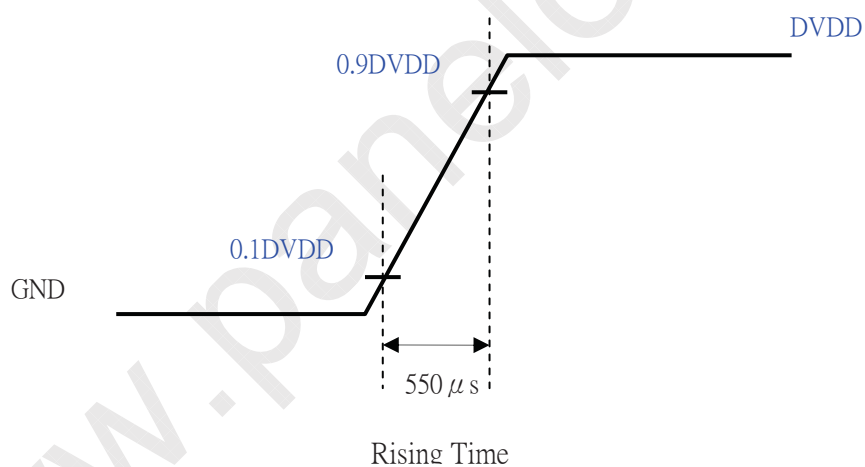
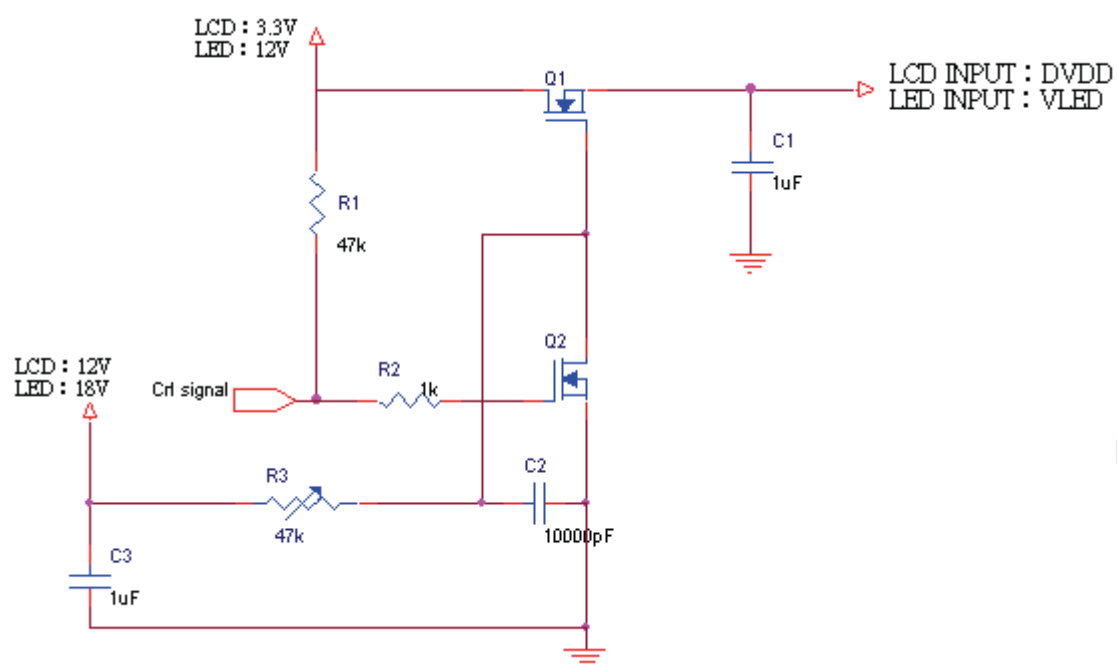
Note3: If users use the product out off the environmental operation range (temperature and humidity) , it will have visual quality concerns.

Note 4 : The input pulse-current measurement system is as below:

Control signal(Crl) :

- 1) LCD : High (+3.3V)→Low (GND)
- 2) LED : High(+12V)→Low(GND)

Supply Voltage of rising time should be from R3 and C2 tune to 550 μs.



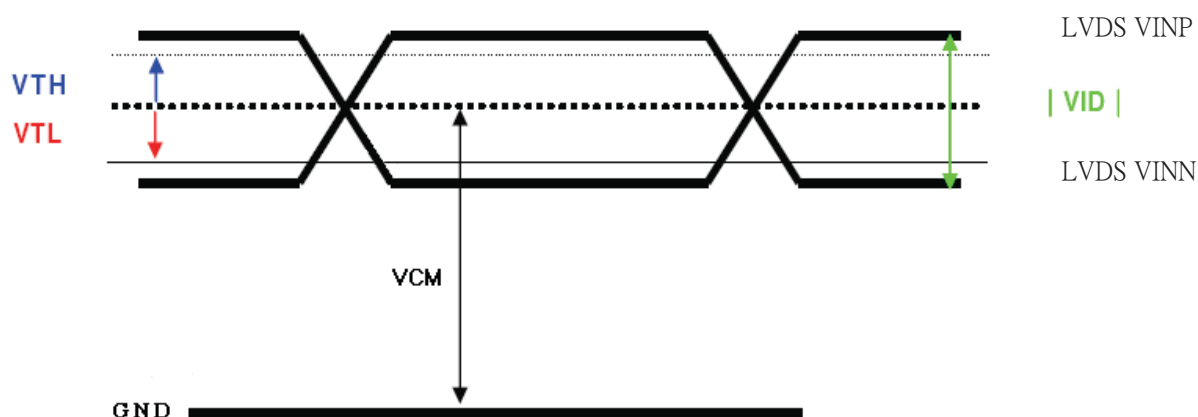
3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD

Ta=25°C

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Digital Power Supply Voltage For LCD	DVDD VDD_LVDS	3	3.3	3.6	V	
Backlight Supply Voltage For LED	VLED	7	12	13	V	
Logic Input Voltage (LVDS:IN+,IN-)	VCM	$\frac{ VID }{2}$		$2.4 - \frac{ VID }{2}$	V	Note1
	VID	100	-	600	mV	Note1
	VTH	-	-	100	mV	VCM=1.2V Note1
	VTL	-100	-	-	mV	
ADJ Input Voltage	VIH	2.1		3.3	V	
	VIL	GND		0.8	V	

Note1: LVDS signal



3.2 TFT-LCD Current Consumption

ITEM	SYMBOL	MIN	TYPE	MAX	UNIT	NOTE
LCD Supply current	DIVDD	--	330	380	mA	Note1
LED Supply current	I_{LED}	--	270	320	mA	Note2

Note1: Typical: Under 64 gray pattern at Typ Freq.
Maximum: Under black pattern at Max Freq.



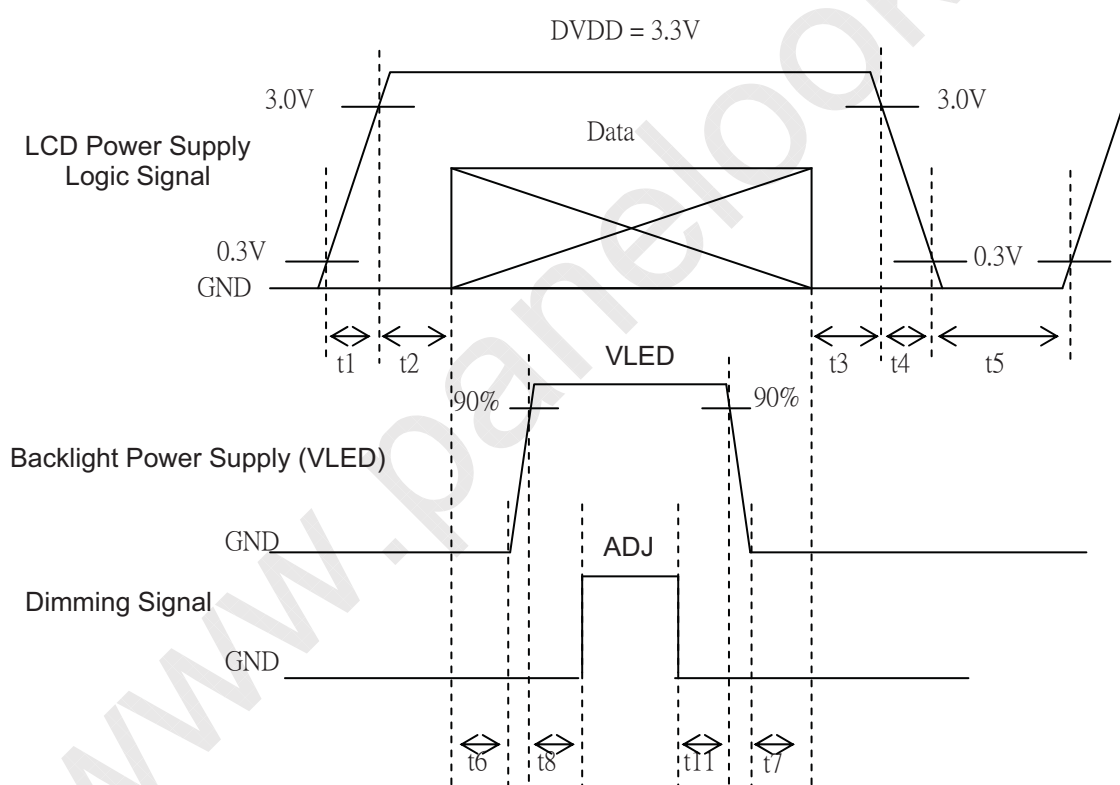
64 gray pattern



Black Pattern

Note2: Typical: When VLED is 12V
Maximum: When VLED is 7V

3.3 Power、Signal sequence



Logic signal : RGB data, DCLK, DENA
Power : DVDD / VLED

$0.5 < t_1 \leq 10\text{ms}$	$200\text{ms} \leq t_6$
$0 < t_2 \leq 50\text{ms}$	$200\text{ms} \leq t_7$
$0 < t_3 \leq 50\text{ms}$	$10\text{ms} \leq t_8$
$0 < t_4 \leq 10\text{ms}$	$10\text{ms} \leq t_9$
$200\text{ms} \leq t_5$	



3.4 Backlight

Ta=25°C

ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
LED Lifetime	--	Ta=25°C IF=20mA	30000	--	--	Hr	
		Ta=60°C IF=20mA	15000	--	--	Hr	

Note :

*1) Definition of Led lifetime : Luminance < Initial luminance 50%.

4. INTERFACE CONNECTION

4.1 CN1 (Input Signal)

PIN NO	SYMBOL	DESCRIPTION
1	GND	Power ground
2	VDD	Digital power
3	VDD	Digital power
4	VDD	Digital power
5	GND	Power ground
6	GND	Power ground
7	ADJ	Adjust for LED brightness
8	NC	No connect
9	GND	Power ground
10	ORXIN0-	Odd pixel negative LVDS differential data inputs
11	ORXIN0+	Odd pixel positive LVDS differential data inputs
12	ORXIN1-	Odd pixel negative LVDS differential data inputs
13	ORXIN1+	Odd pixel positive LVDS differential data inputs
14	ORXIN2-	Odd pixel negative LVDS differential data inputs
15	ORXIN2+	Odd pixel positive LVDS differential data inputs
16	ORXCLKIN-	Odd pixel negative LVDS differential clock inputs
17	ORXCLKIN+	Odd pixel positive LVDS differential clock inputs
18	NC	No connect
19	NC	No connect
20	ERXIN0-	Even pixel negative LVDS differential data inputs
21	ERXIN0+	Even pixel positive LVDS differential data inputs
22	ERXIN1-	Even pixel negative LVDS differential data inputs
23	ERXIN1+	Even pixel positive LVDS differential data inputs
24	ERXIN2-	Even pixel negative LVDS differential data inputs
25	ERXIN2+	Even pixel positive LVDS differential data inputs
26	ERXCLKIN-	Even pixel negative LVDS differential clock inputs
27	ERXCLKIN+	Even pixel positive LVDS differential clock inputs
28	NC	No connect
29	NC	No connect
30	GND	Power ground
31	NC	No connect
32	NC	No connect
33	NC	No connect
34	NC	No connect
35	VLED	Power supply for LED
36	VLED	Power supply for LED
37	VLED	Power supply for LED
38	LED-GND	Power ground for LED
39	LED-GND	Power ground for LED
40	LED-GND	Power ground for LED

Remarks :

1) Mating connector : I-PEX 20453-040T

2).The ADJ can adjust LED BL brightness , where Duty and Luminance are in direct radio.

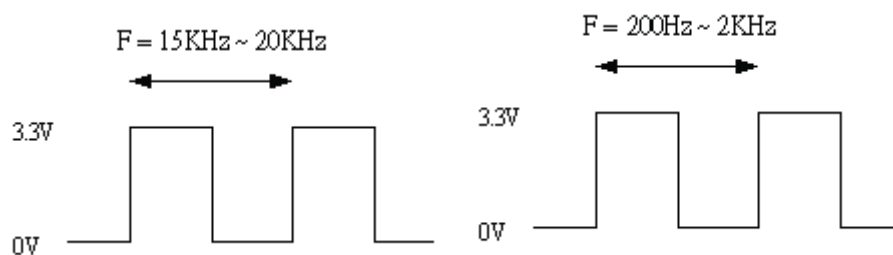


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- 3) The ADJ adjust signal level is 0~3.3V , operation frequency:15KHz~20KHz , Duty range : 10%~100%.
operation frequency:200Hz~2KHz , Duty range : 1%~10%.

* When frequency at 200Hz~2KHz, it may cause the audible noise happened



5. INPUT SIGNAL(DE ONLY MODE)

5.1 Timing Specification

ITEM				SYMBOL	MIN	TYP	MAX	UNIT
LVDS input signal sequence	Frame rate			-	40	60	60	Hz
	CLK Frequency			tclk	31.65	48.3	50.76	MHz
LCD input signal sequence (Input LVDS Transmitter)	DENA	Horizontal	Horizontal total Time	t_H	860	865	900	tCLK
			Horizontal effective Time	t_{HA}	800			tCLK
			Horizontal Blank Time	t_{HB}	60	65	100	tCLK
	Vertical	Vertical	Vertical total Time	t_V	920	930	940	t_H
			Vertical effective Time	t_{VA}	900			t_H
			Vertical Blank Time	t_{VB}	20	30	40	t_H

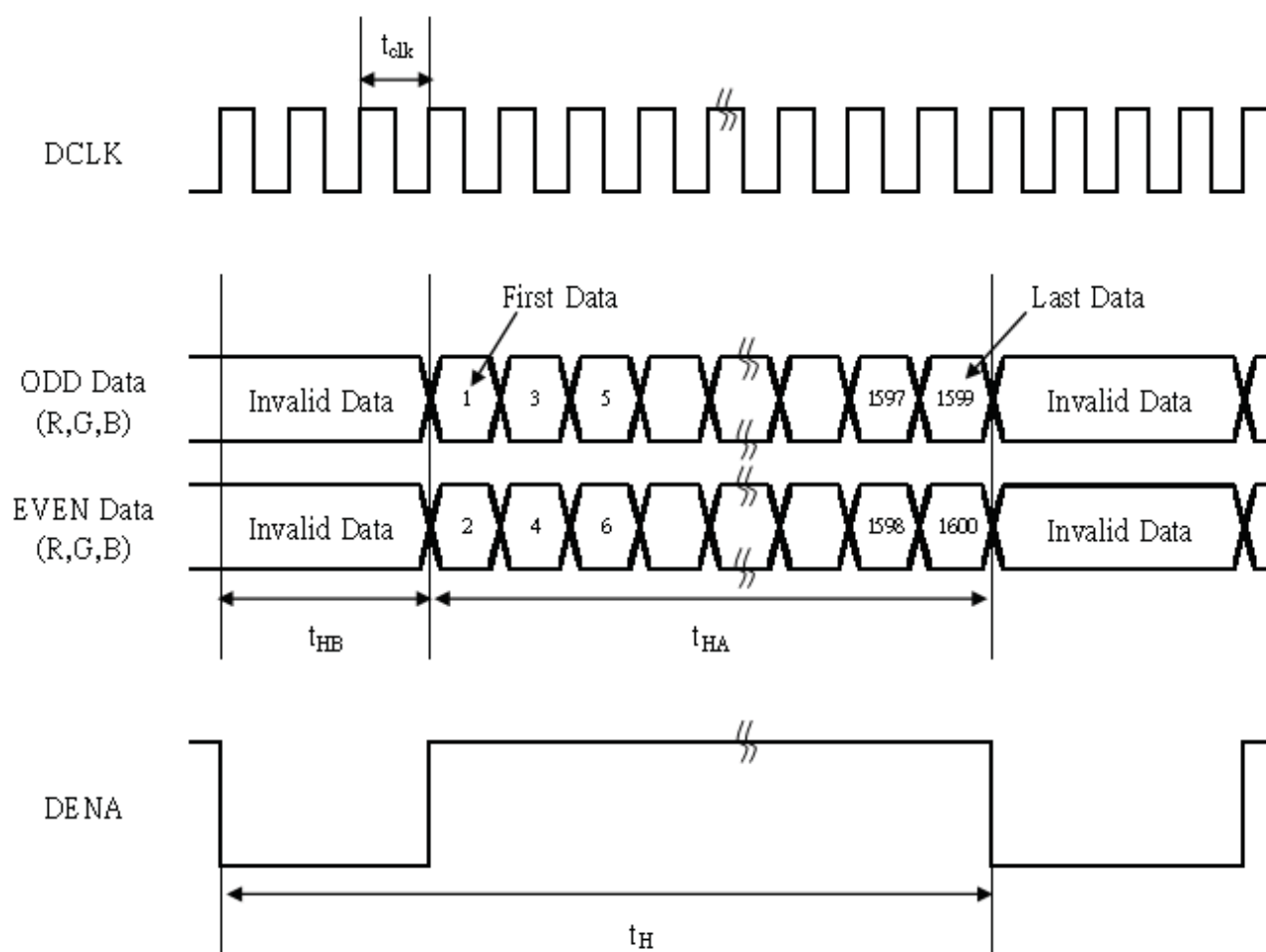
* LVDS input CLK frequency is suit to one port

* Frame rate at 40Hz is suit to static state, in the movement may cause the lag happened.

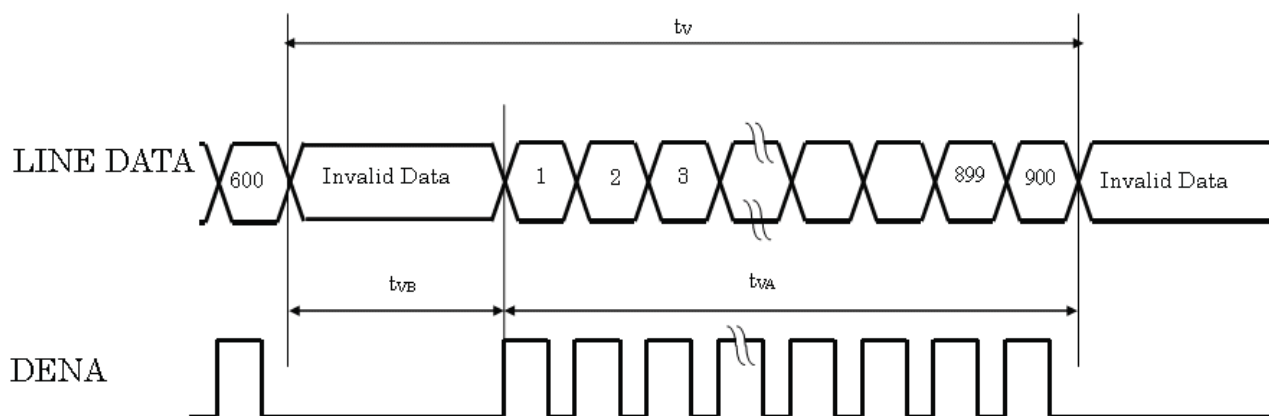
* Frame rate at 40Hz may cause the filcker happened

5.2 Timing sequence(Timing chart)

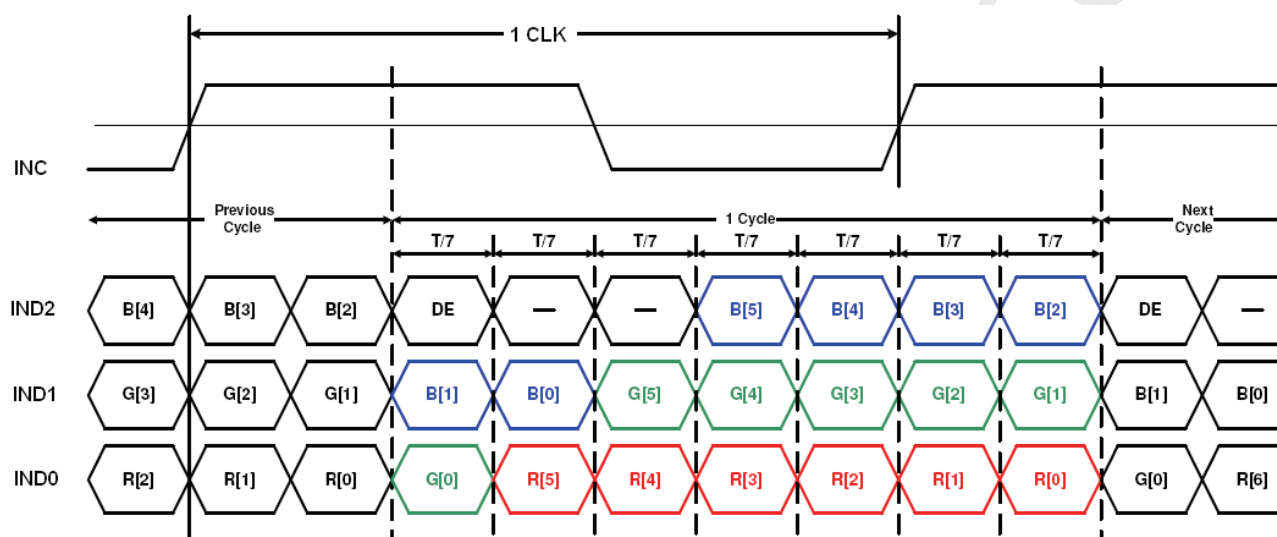
5.2.1 Horizontal Timing Sequence



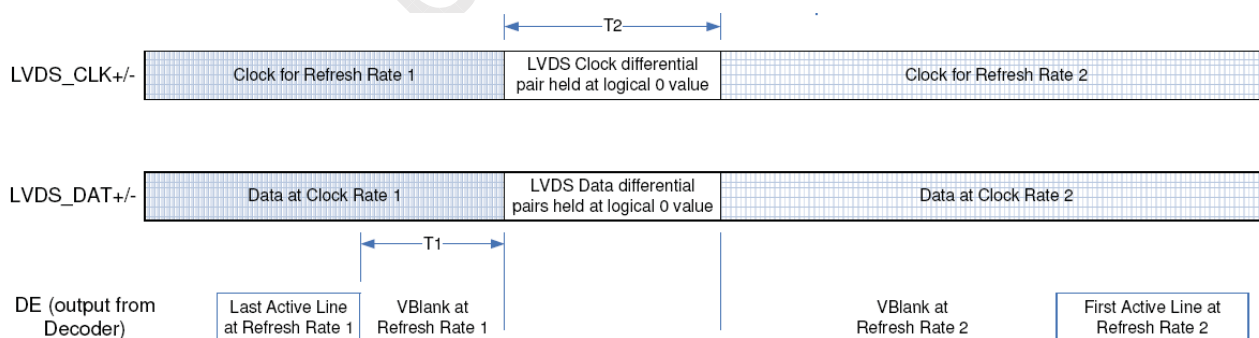
5.2.2 Vertical Timing Sequence



5.2.3 LVDS Input Data mapping



5.2.4 Power saving function of SDRRS

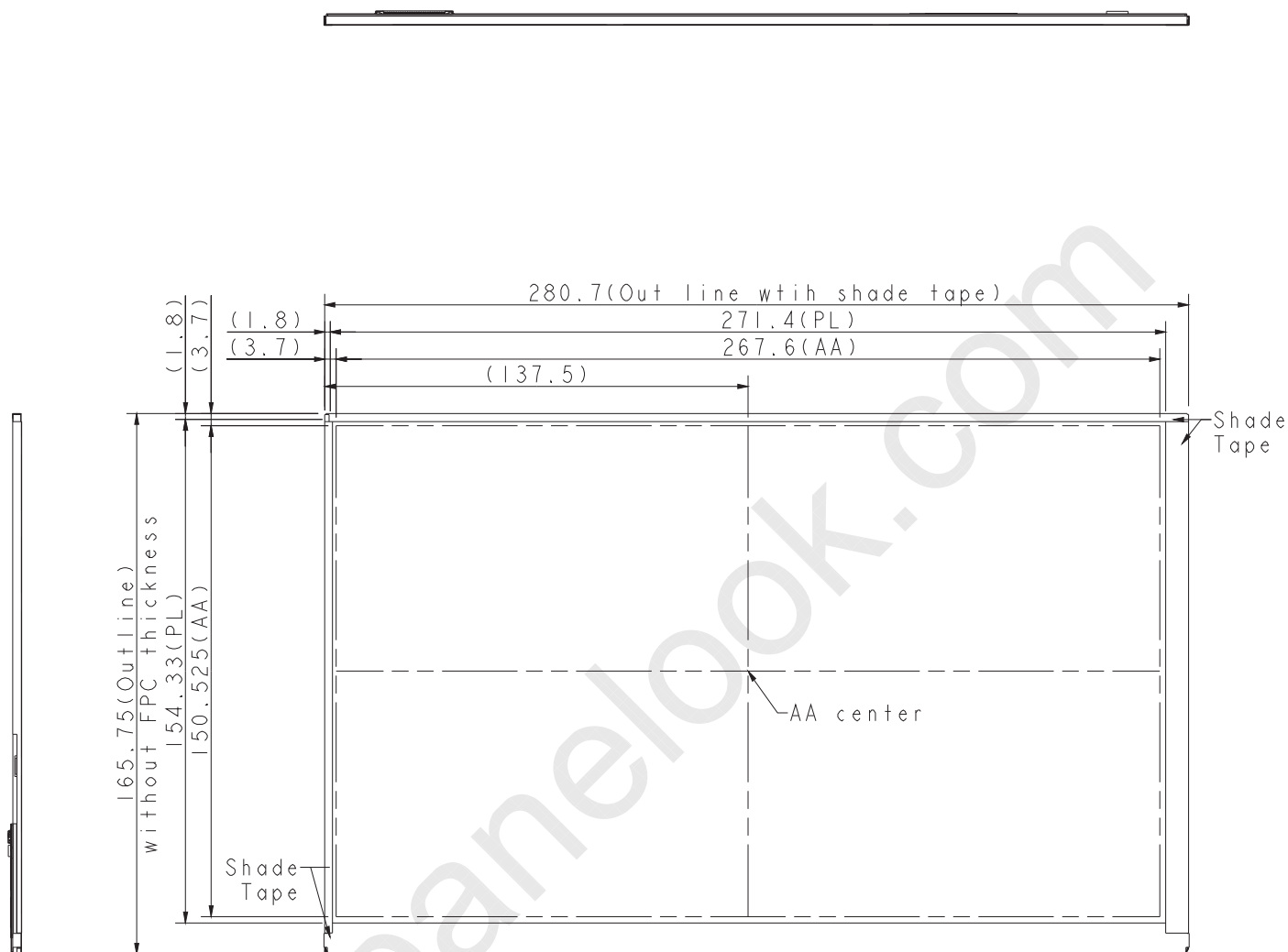


Symbol	Units	Min	Max	Note
T1	Lines	2	3	
T2	uS	50	100	

6. MECHANICAL DIMENSION

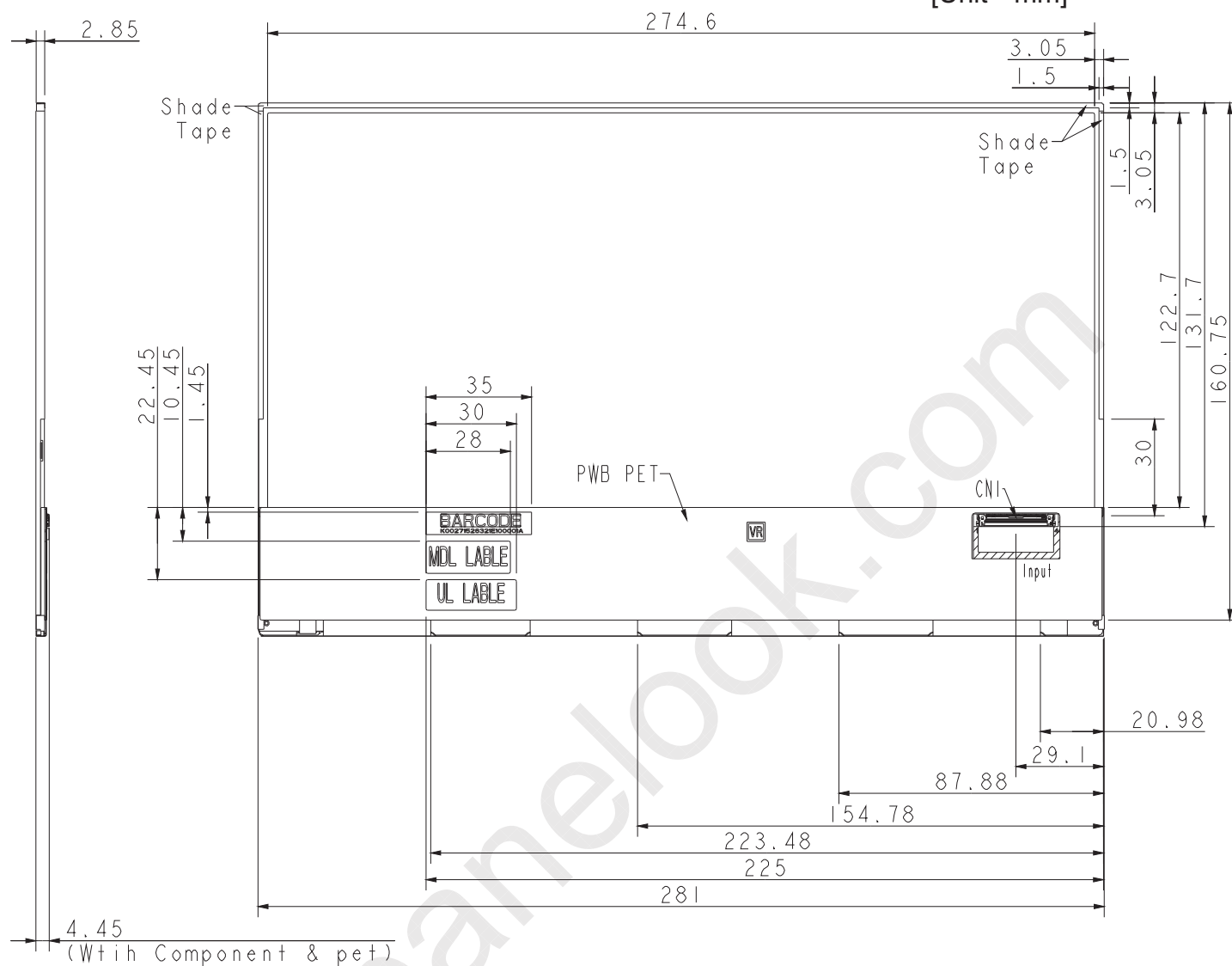
6.1 Front Side

[Unit : mm]



6.2 Rear Side

[Unit : mm]

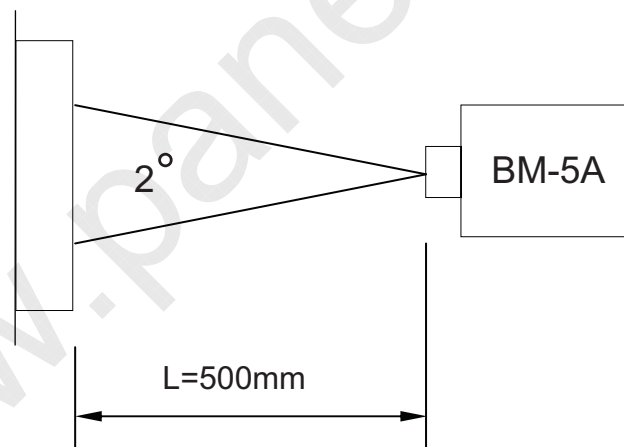
Remark : Un-indication tolerance is $\pm 0.3\text{mm}$

7. OPTICAL CHARACTERISTICS

Ta = 25°C, VCC=3.3V

ITEM		SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
Contrast Ratio		CR	Point-5	300	500	--	--	1, 2, 3
Luminance(CEN)		Lw	Point-5	--	250	--	cd/m ²	1, 3
Luminance Uniformity		ΔL	13 points	60	--	--	%	1, 3
Response Time (White - Black)		Tr +Tf	Point-5	--	20	35	ms	1, 3, 5
NTSC		-	Point-5	40	45	--	%	1, 3
Viewing Angle	Horizontal		CR ≥ 10 Point-5	R:35 /L:35	R:45 /L:45	--	°	1, 3
	Vertical			U:5 /D:25	U:15 /D:35	--	°	1, 2, 4
Color Coordinate	White	Wx Wy	Point-5	0.273 0.289	0.313 0.329	0.353 0.369	--	1, 3
	Red	Rx Ry		(0.529) (0.297)	(0.569) (0.337)	(0.609) (0.377)		
	Green	Gx Gy		(0.296) (0.531)	(0.336) (0.571)	(0.376) (0.611)		
	Blue	Bx By		(0.113) (0.062)	(0.153) (0.102)	(0.193) (0.142)		

Note1: Measure condition : 25°C±2°C , 60±10%RH , under10 Lux in the dark room.BM-5A (TOPCON) , viewing angle2° , VLED=12V , measurement after lighting on 10 mins.



Note2: Definition of contrast ratio :

Contrast Ratio (CR)= (White) Luminance of ON ÷ (Black) Luminance of OFF

Note3: Central luminance: The white luminance is measured at the center position "5" on the screen, see Fig.7-1.

13P Uniformity: $\Delta L = (L_{\min} / L_{\max}) \times 100\%$

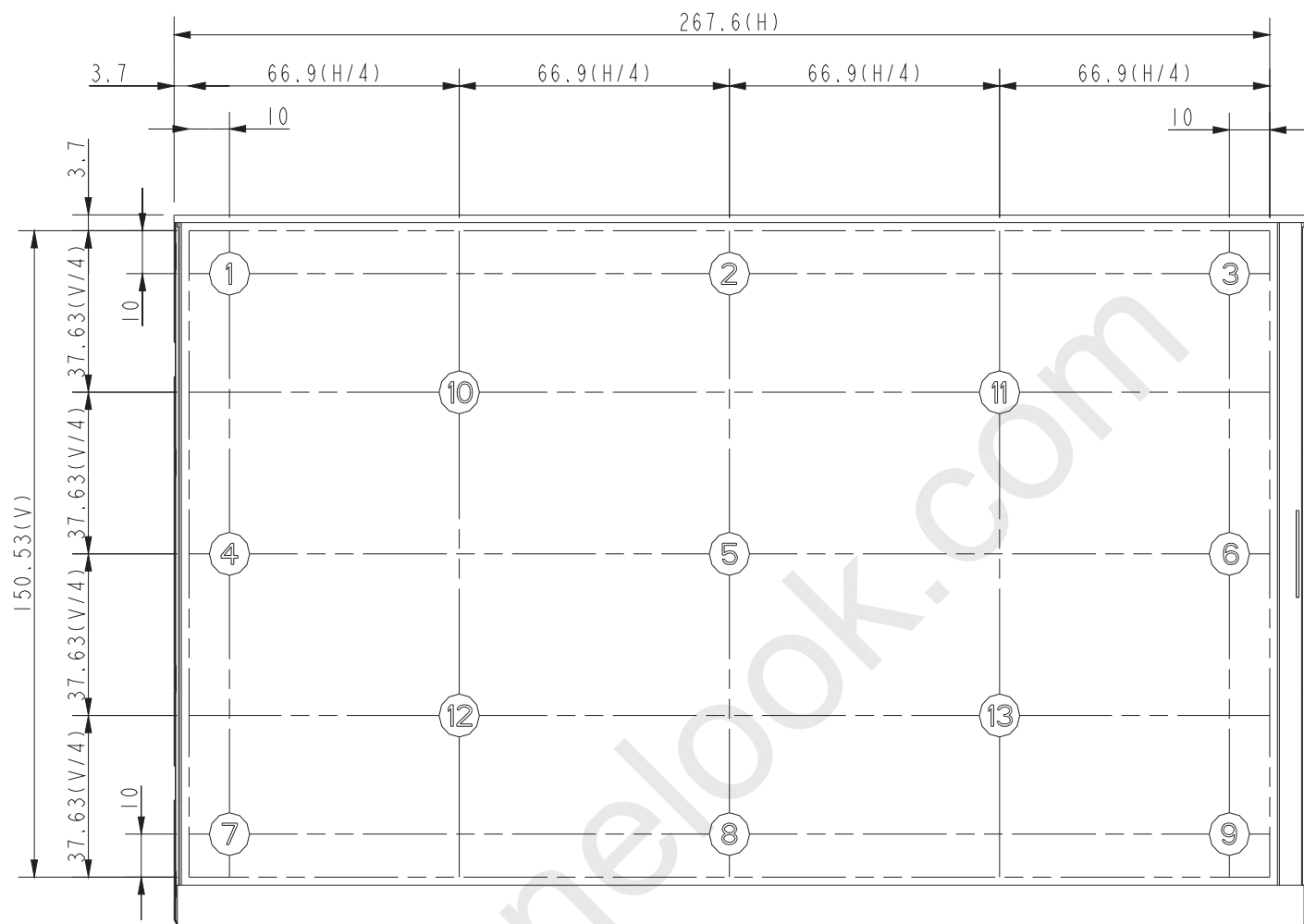


Fig.7-1 Measuring point

Note 4: Definition of Viewing Angle(θ, ψ), refer to Fig.7-2 as below :

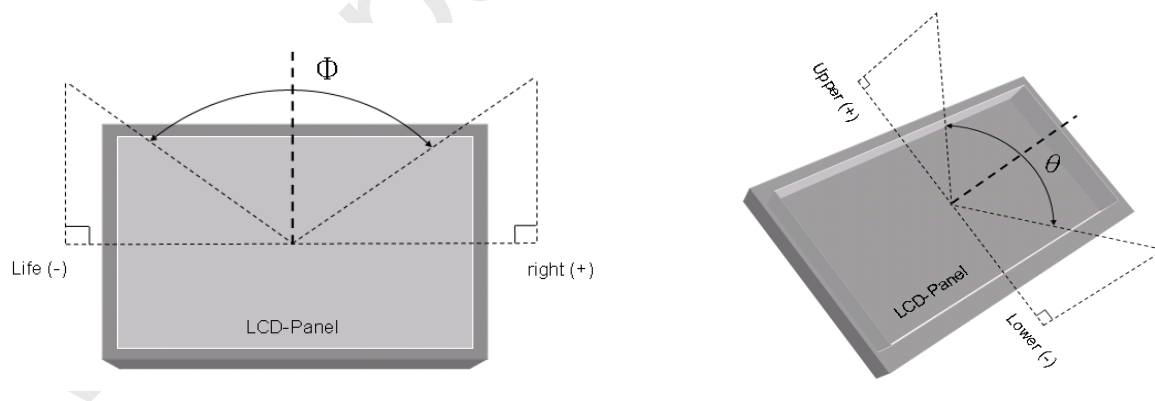


Fig.7-2 Definition of Viewing Angle

Note5: Definition of Response Time.(White-Black)

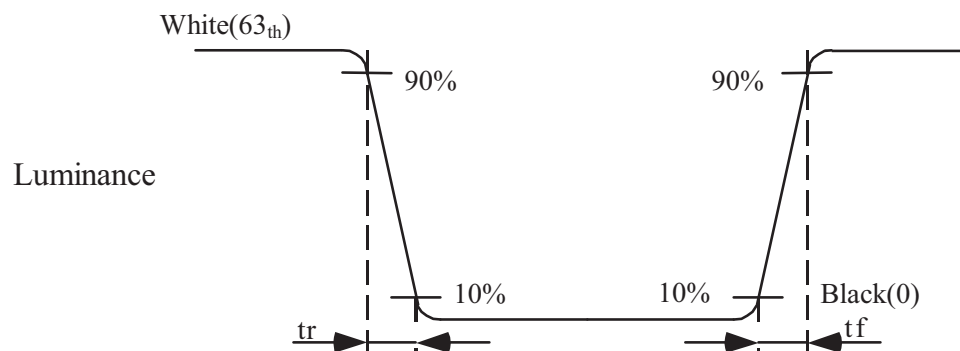


Fig.7-3 Definition of Response Time(White-Black)

8. RELIABILITY TEST

8.1. Temperature and humidity

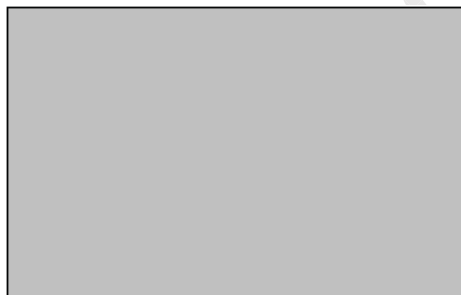
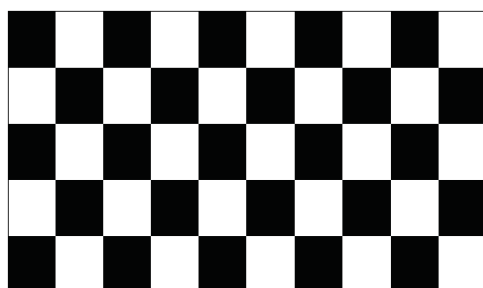
TEST ITEMS	CONDITIONS	NOTE
High Temperature Operation	60℃, 500h	
High Temperature Storage	60℃, 72h	
High Temperature High Humidity Storage	40℃, 90%, 96h	No condensation
Low Temperature Operation	0℃, 500h	
Low Temperature Storage	-20℃, 72h	
Thermal Shock (No operation)	-20℃ (30min) <=> 60℃ (30min), 100cycle	
Push Test	9points, min.3kgf, 5sec	
Image Sticking	25℃ ; 4Hrs	

Note :

Condition of Image Sticking test : 25 °C ± 2 °C

Operation with test pattern sustained for 4 hrs, then change to gray pattern immediately.

After 5 mins, the mura must be disappeared completely .



8.2. Shock and Vibration

TEST ITEMS	CONDITIONS
Shock (Non-operation)	Shock level : 2156m/s² (220G), Waveform : half sinusoidal wave, 2ms, 6 axis (± X, ± Y, ± Z) per cycle
Vibration (Non-operation)	- Vibration level : 14.7m/s² (1.5G), sinusoidal wave (each x, y, z axis : 1hr, total 3hrs) - Frequency range : 5 ~ 500 Hz - Sweep speed : 0.5 Octave/min.

8.3 Electrostatic Discharge

TEST ITEM	CONDITIONS	Note
ESD	150pF , 330Ω , ±8kV&±15kV air& contact test	1
	200pF , 0Ω , ±250V contact test	2

Note: Measure

1: LCD glass and metal bezel

2: IF connector pins

8.4. Judgment standard

The Judgment of the above test should be made as follow:

Pass: Normal display image with no obvious non-uniformity and no line defect. Partial



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transformation of the module parts should be ignored.
Fail:No display image,obvious non-uniform

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